

Amendments to the Claims:

The following is a complete list of claims indicating the changes incorporated by the present amendment and replacing all prior versions of the claims:

WHAT IS CLAIMED IS:

1 **Claim 1 (currently amended):** A method for forming a dense composite of silicon nitride and
2 silicon carbide, said method comprising:

3 (a) mechanically activating a powder mixture of amorphous silicon nitride and
4 silicon carbide in the presence of at most 1% by weight of metal oxide densification aids,
5 said powder mixture consisting essentially of particles less than 100 nanometers in
6 diameter; and

7 (b) consolidating said powder mixture **so activated** into a continuous mass by
8 compressing said powder mixture while passing an electric current through said powder
9 mixture, to achieve a fused mass of silicon nitride and silicon carbide crystals.

1 **Claim 2 (original):** The method of claim 1 in which said mechanically activated powder
2 mixture resulting from step (a) consists essentially of particles of about 1 micron to about 10
3 microns in diameter, and said fused mass produced in step (b) consists essentially of crystalline
4 grains less than 100 nm in diameter.

1 **Claim 3 (original):** The method of claim 1 in which said mechanically activated powder
2 mixture resulting from step (a) consists essentially of particles of about 1 micron to about 5
3 microns in diameter, and said fused mass produced in step (b) consists essentially of crystalline
4 grains less than 50 nm in diameter.

1 **Claim 4 (currently amended):** The method of claim 1 in which any metal oxide densification
2 aid present in said powder mixture constitutes at most about 0.5% by weight of said powder
3 mixture **of step (a)**.

1 **Claim 5 (currently amended):** The method of claim 1 in which any metal oxide densification
2 aid present in said powder mixture of step (a) constitutes at most about 0.1% by weight of said
3 powder mixture of step (a).

1 **Claim 6 (currently amended):** The method of claim 1 in which said powder mixture of step
2 (a) is devoid of metal oxide densification aids.

1 **Claim 7 (currently amended):** The method of claim 1 in which said powder mixture of step
2 (a) consists essentially of from about 10 to about 60 parts by volume silicon, from about 10 to
3 about 60 parts by volume carbon, and from about 10 to about 60 parts by volume nitrogen, based
4 on a total of 100 parts by volume of said powder mixture of step (a).

1 **Claim 8 (currently amended):** The method of claim 1 in which said powder mixture of step
2 (a) consists essentially of from about 10 to about 30 parts by volume silicon, from about 25 to
3 about 50 parts by volume carbon, and from about 25 to about 50 parts by volume nitrogen, based
4 on a total of 100 parts by volume of said powder mixture of step (a).

1 **Claim 9 (currently amended):** The method of claim 1 further comprising forming said powder
2 mixture of step (a) by pyrolysis of a polyorganosilazane in an inert atmosphere.

1 **Claim 10 (original):** The method of claim 9 in which said polyorganosilazane is a
2 polyureasilazane.

1 **Claim 11 (currently amended):** The method of claim 1 in which step (b) comprises
2 compressing said powder mixture of step (a) at a pressure of about 10 MPa to about 200 MPa
3 and a temperature of from about 900°C to about 3,000°C, and said electric current is a pulsed
4 direct current of about 1,000 A/cm² to about 10,000 A/cm².

1 **Claim 12 (original):** The method of claim 11 in which said pressure is about 40 MPa to about
2 100 MPa.

1 **Claim 13 (original):** The method of claim 11 in which said temperature is about 1,000°C to
2 about 2,000°C.

1 **Claim 14 (original):** The method of claim 11 in which said pulsed direct current is about 1,500
2 A/cm² to about 5,000 A/cm².

1 **Claim 15 (original):** The method of claim 1 in which step (b) is performed to achieve a fused
2 mass with a density of at least 95% relative to a volume-averaged theoretical density.

1 **Claim 16 (original):** The method of claim 1 in which step (b) is performed to achieve a fused
2 mass with a density of at least 98% relative to a volume-averaged theoretical density.

1 **Claim 17 (original):** The method of claim 1 in which step (b) is performed to achieve a fused
2 mass with a density of at least 99% relative to a volume-averaged theoretical density.

1 **Claim 18 (original):** The method of claim 1 in which step (a) comprises milling said powder
2 mixture by high-energy ball milling.

1 **Claim 19 (original):** The method of claim 18 in which said high-energy ball milling is
2 performed with silicon nitride milling balls in a rotary mill at about 6 impacts per second or more
3 and a charge ratio of at least about 10.

1 **Claim 20 (original):** The method of claim 18 in which said high-energy ball milling is
2 performed with silicon nitride milling balls in a rotary mill at from about 6 to about 60 impacts
3 per second and a charge ratio of about 10 to about 20.

1 **Claim 21 (withdrawn):** A dense composite of silicon nitride and silicon carbide consisting
2 essentially of silicon nitride crystals of less than 100 nanometers in diameter and said silicon
3 carbide crystals of less than 100 nanometers in diameter and containing at most 1% by weight of
4 metal oxide densification aids, produced by a process comprising:

5 (a) mechanically activating a powder mixture of amorphous silicon nitride and
6 silicon carbide in the presence of at most 1% by weight of metal oxide densification aids,

7 said powder mixture consisting essentially of particles less than 100 nanometers in
8 diameter; and

9 (b) consolidating said powder mixture into a continuous mass by compressing
10 said powder mixture while passing an electric current through said powder mixture, to
11 achieve a fused mass of silicon nitride and silicon carbide crystals.

1 **Claim 22 (withdrawn):** The dense composite of claim 21 in which said mechanically activated
2 powder mixture resulting from step (a) consists essentially of particles of about 1 micron to
3 about 10 microns in diameter, and said fused mass produced in step (b) consists essentially of
4 crystalline grains less than 100 nm in diameter.

1 **Claim 23 (withdrawn):** The dense composite of claim 21 in which said mechanically activated
2 powder mixture resulting from step (a) consists essentially of particles of about 1 micron to
3 about 5 microns in diameter, and said fused mass produced in step (b) consists essentially of
4 crystalline grains less than 50 nm in diameter.

1 **Claim 24 (withdrawn):** The composite of claim 21 in which any metal oxide densification aid
2 present in said powder mixture constitutes at most about 0.5% by weight of said powder mixture.

1 **Claim 25 (withdrawn):** The composite of claim 21 in which any metal oxide densification aid
2 present in said powder mixture constitutes at most about 0.1% by weight of said powder mixture.

1 **Claim 26 (withdrawn):** The composite of claim 21 in which said powder mixture is devoid of
2 metal oxide densification aids.

1 **Claim 27 (withdrawn):** The composite of claim 21 in which said powder mixture consists
2 essentially of from about 10 to about 60 parts by volume silicon, from about 10 to about 60 parts
3 by volume carbon, and from about 10 to about 60 parts by volume nitrogen, based on a total of
4 100 parts by volume of said powder mixture.

1 **Claim 28 (withdrawn):** The composite of claim 21 said powder mixture consists essentially of
2 from about 10 to about 30 parts by volume silicon, from about 25 to about 50 parts by volume

3 carbon, and from about 25 to about 50 parts by volume nitrogen, based on a total of 100 parts by
4 volume of said powder mixture.

1 **Claim 29 (withdrawn):** The composite of claim 21 in which said powder mixture is formed by
2 pyrolysis of a polyorganosilazane in an inert atmosphere.

1 **Claim 30 (withdrawn):** The composite of claim 29 in which said polyorganosilazane is a
2 polyureasilazane.

1 **Claim 31 (withdrawn):** The composite of claim 21 in which step (b) comprises compressing
2 said powder mixture at a pressure of about 10 MPa to about 200 MPa and a temperature of from
3 about 900°C to about 3,000°C, and said electric current is a pulsed direct current of about 1,000
4 A/cm² to about 10,000 A/cm².

1 **Claim 32 (withdrawn):** The composite of claim 31 in which said pressure is about 40 MPa to
2 about 100 MPa.

1 **Claim 33 (withdrawn):** The composite of claim 31 in which said temperature is about 1,000°C
2 to about 2,000°C.

1 **Claim 34 (withdrawn):** The composite of claim 31 in which said pulsed direct current is about
2 1,500 A/cm² to about 5,000 A/cm².

1 **Claim 35 (withdrawn):** The composite of claim 21 in which said fused mass has a density of at
2 least 95% relative to a volume-averaged theoretical density.

1 **Claim 36 (withdrawn):** The composite of claim 21 in which said fused mass has a density of at
2 least 98% relative to a volume-averaged theoretical density.

1 **Claim 37 (withdrawn):** The composite of claim 21 in which said fused mass has a density of at
2 least 99% relative to a volume-averaged theoretical density.

1 **Claim 38 (withdrawn):** The composite of claim 21 in which step (a) comprises milling said
2 powder mixture by high-energy ball milling.

1 **Claim 39 (withdrawn):** The composite of claim 38 in which said high-energy ball milling is
2 performed with silicon nitride milling balls in a rotary mill at about 6 impacts per second or more
3 and a charge ratio of at least about 10.

1 **Claim 40 (withdrawn):** The composite of claim 38 in which said high-energy ball milling is
2 performed with silicon nitride milling balls in a rotary mill at about 6 to about 60 impacts per
3 second and a charge ratio of about 10 to about 20.